Redesign of Pedigree Displays through User-Centered Visualization

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Abstract A complete family history is critical to the assessment of genetic risk of hereditary diseases. Kinsys© is a family history-tracking program used by genetic counselors and healthcare professionals for risk assessment. A pedigree, which is a graphic drawing of family history, is the most important component in such a program. In this project, we analyzed the current pedigree displays of Kinsys© and identified their problems and limitations; and we developed innovative pedigree displays by principles of user-centered visualization methodology for a new version of Kinsys© that overcome some limitations of the original displays.

Introduction

The basic medical pedigree is a graphic depiction of how family members are biologically and legally related to one another, from one generation to the next. It is a symbolic language of clinical genetic services and human genetic research.

Correct interpretation of a family pedigree is essential to human genetics research. Kinsys© is a cancer genetics family history-tracking program that was designed and developed at The University of Texas M. D. Anderson Cancer Center (UTMDACC) for conducting cancer genetics studies in 1997[1]. The software consists of three main components: data entry forms, a pedigree-drawing tool and a backend database. A pedigree drawing component provided by Cyrillic (Cherwell Scientific, www.Cyrillicsoftware.com) was used in the original Kinsys©. However, it must be associated with a lot of internal work and training to recognize each symbol's meaning. Some of them are prone to errors and misinterpretations. How to better display the information in a pedigree is a key issue in the design of a new version Kinsys©' pedigree drawing component.

Methods

Bennett's Standardized Pedigree Nomenclature[2] was used as the reference of the conventional symbology for pedigrees. We used the methodology of user-centered information visualization[4] and the principles of relational information displays[5] as the guidelines for the design and development of our new user-centered pedigree displays. As one step in our study, we analyzed two commercial pedigree display tools (Cyrillic™ and Progeny™) to find out their good and poor features in usability. In our development of the pedigrees of Kinsys©, we created and illustrated the diabetic family pedigree with diagnosis report and complication report. In addition, we added disease oriented report generating functionality by using data visualization principles.

Discussion and Conclusion

User-centered information visualization can be used to design intuitive and use-to-understand displays that are not only tailored for a specific user but also customized to a specific task in a specific context. In our current study we created displays according to the principles of user-centered information visualization. For example, using symbols instead of words externalizes the information and is much easier to be seen by the users. The assumption is that they are easy to use, easy to understand, and easy to learn. However, we have not performed an empirical evaluation of our designs yet. This is the subject of our follow up study.

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